University of Minnesota

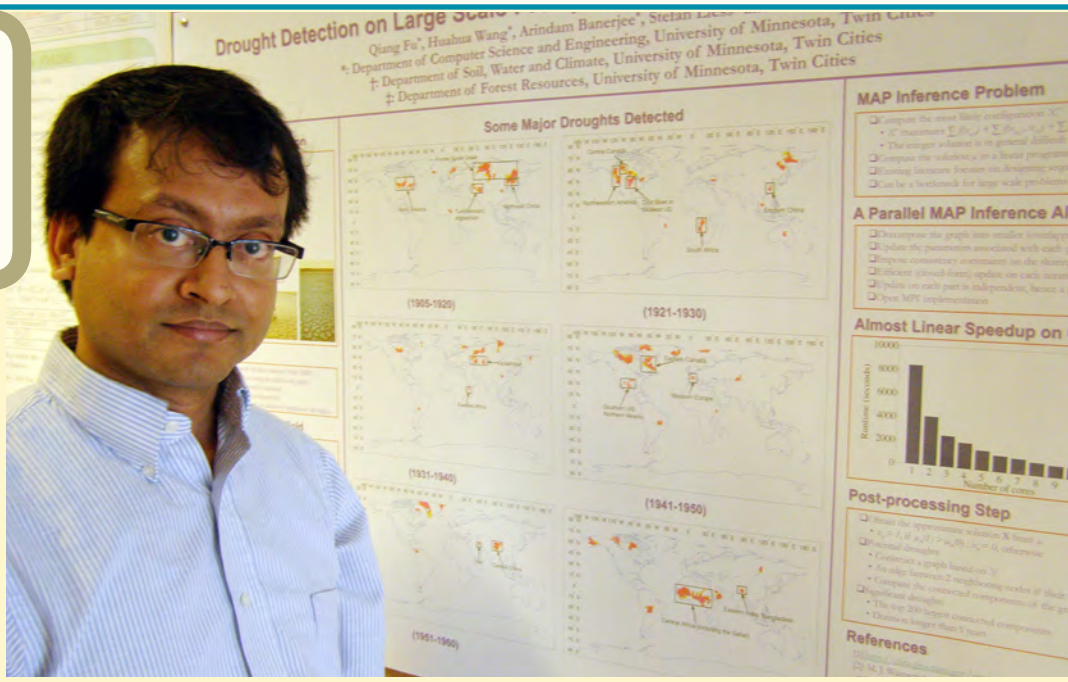
SOUNDBYTE

Spring I Summer 2013

# Teaching Machines

Associate Professor Arindam Banerjee's work in machine learning offers compelling methods that can be applied to social networking, finance, and environmental research.

***By Pamela Vold***




Arindam Banerjee studies machine learning

Machine learning is as ubiquitous as the internet itself. Each time we make a click, our software and search engines are trying to figure our next step before we make it. The spam detector tries to figure out what is spam so it doesn't clutter our inboxes. Our search engines are looking at our searches and trying to determine whether we are really going to buy the camera that we just searched for, or are we still browsing? Are we looking for features or comparing prices? If they make the wrong call, you could get a good deal when you click through and buy it. If the consumer clicks on the third link instead of the first, then the search engine learns to re-order.

According to Associate Professor Arindam Banerjee, machine learning is really about intent. This is especially true in the context of ad serving, which drives the revenues of companies like Google and Facebook. He is applying his work in machine learning to some very interesting applications, from social media to the stock market. How do we determine what we buy and sell? Banerjee explains, "We often make choices without knowing how they are going to pan out. For example, during the morning commute, I get stuck in traffic, I can take an exit and not know that they haven't cleared the snow on that road." The same methods that you and I use on the morning commute, can be applied to determine stock market investments. "It's all about making a decision without fully knowing what is happening."

Banerjee applies his work to large scale data analysis. He says, "Twitter is generating 400M tweets per day. If I'm fitting the data curve like they taught us in undergrad, they never taught us that there would be hundreds of millions of data points every day and the curve would change every day. The way this is done is essentially changing one data point at a time." Banerjee says, "This is just like a financial portfolio selection – the key to finding online data points is that you never try to process the entire thing at once." With his Ph.D. student Puja Das, Banerjee is running trades from 1990 that will reach

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## Inside

# *Message* from the Department Head

Photo by Richard G. Anderson

## HIGHLIGHTS

A new advisory board, the Industry Affiliates Council

the 2013 Open House and Tech Forum

We have marked the end of another academic year with plenty of exciting changes in the department.The class of 2013 includes more than 250 distinguished B.S., M.S. and Ph.D. students who are now entering the workforce to carry out our tradition of scholarship and excellence. We are pleased to report that those graduates are in high demand. Many of our recent graduates have had full-time employment lined up for more than a year before their graduation date.

Due in part to this surge of interest in our students, we have undertaken an exciting initiative this year with the start of a new advisory group for the department. The new group, the Industry Affiliates Council (IAC), is chartered to promote greater interaction between the Department of Computer Science and Engineering and our industry affiliates. The Council will meet twice each year, providing a forum to hear industry trends and to explore the opportunities that grow out of the department's education and research activities. Our council members are invited to be active in promoting computer science through efforts to broaden the field, reach out to underrepresented groups, and promote and advance the economic impact of education and research. Our members will be involved in recruitment events, research, networking and involved in supporting our next wave of the workforce, our students. Our first cohort of companies have signed on as charter members of the Council, and we look forward to adding more partners to our membership this year, as the Council becomes more involved in the activities of the department.

One of those activities will be our biennial Open House and Tech Forum, scheduled for October 18, 2013. The attendance at our Open House has exceeded the capabilities of our home, Keller Hall, and this year's event will be held in McNamara Alumni Center, with a keynote provided by Roni Kohavi. Kohavi is a partner architect in the Online Services Division at Microsoft. He joined Microsoft in 2005 and founded the Experimentation Platform team in 2006. He was previously the director of data mining and personalization at Amazon.com, and the Vice President of Business Intelligence at Blue Martini Software which was acquired by Red Prairie. Prior to joining Blue Martini, Kohavi managed MineSet project, Silicon Graphics' award-winning product for data mining and visualization. He joined Silicon Graphics after getting a Ph.D. in Machine Learning from Stanford University, where he led the MLC++ project, the Machine Learning library in C++ used in MineSet and at Blue Martini Software. The Open House will include our popular poster session featuring the work our faculty, students and industry friends. We will return to our afternoon programming as well, with a panel discussion by CS&E faculty.

This great event for past, present, and future students, industry and friends of the department is a highlight of the year for the department. Look for more announcements and registration information via email this summer. The Open House is a wonderful day of learning about computing research in the department and beyond, and I look forward to sharing our exciting work with you.

— **Vipin Kumar,** CS&E Department Head and William Norris Professor

# department NEWS

## Local and national news

The recommender work of Professor **John Riedl** was featured on the researchumn.com website. The story tracked Riedl's work in social computing, citing that "During the past decade, social computing has helped elect presidents and topple governments and created the largest encyclopedia in history." Says Riedl, "My research aims to create new ways for groups to work and play together."

Professor **Shashi Shekhar** has been appointed a member of the National Research Council Computer Science and Telecommunications Board (NRC/CSTB) committee on Geotargeted Disaster Alerts and Warnings (GDAW). The NRC is the operating arm of the National Academies, which provides science, technology and health policy advice under a congressional charter signed by President Abraham Lincoln that was originally granted in 1863. This GDAW committee will consider the potential for more precise geographical targeting to improve the effectiveness of disaster alerts and warnings; examine the opportunities presented by current and emerging technologies to create, deliver, and display alerts and warnings with greater geographic precision; consider the circumstances where more granular targeting would be useful; and examine the roles of federal, state, and local agencies and private sector information and telecommunications providers in delivering more targeted alerts. Previously, Professor Shekhar served on National Academies committees on Mapping Sciences (2003-2009), Priorities for GEOINT Research at the National Geospatial-Intelligence Agency (2004-2006) and Future U.S. Work-force for Geospatial intelligence (2011-2012).

New research on Pinterest by **Loren Terveen** was picked up in several news outlets. This first-ever academic study of Pinterest by University of Minnesota and Georgia Tech researchers gives new insight into activity on the social network. The results show some interesting gender differences as well as important information for product marketers.

CS&E startup ReconRobotics announced that it was recognized as one of the World's Most Innovative Companies by *Fast Company* magazine. Inventor of the tactical micro-robot and a major supplier of robotic technologies to military units and law enforcement agencies worldwide, ReconRobotics was ranked 44th on the list of honorees, which also included Nike, Amazon, Samsung and Google. "This is a great honor for our young company and each one of our 58 employees," said Alan Bignall, President and CEO of ReconRobotics. "Our world-class design and engineering teams develop ultra-lightweight robots that save lives, and I am ecstatic that their creativity and problem solving have been recognized by *Fast Company*." The Most Innovative Companies is *Fast Company's* most significant, high-profile editorial effort of the year, recognizing "enterprises that exemplify the best in business from across the economy and around the world." The 2013 list appeared in the March issue, which is available online.

A recent article on big data in the *Twin Cities Business Journal* featured the work of CS&E alumni Prasanna Desikan, Robert Cooley and Professor **Jaideep Srivastava**. Desikan is senior scientific advisor for the Center for Healthcare Research & Innovation at Allina Health System in Minneapolis, and Cooley is chief technology officer for OptiMine Software, Inc. Cooley and Desikan both received their Ph.D.s from the University of Minnesota. The article, "The Many Uses of Big Data," discusses the overwhelming volume of data that is being created, 2.5 quintillion bytes of data every day, and how that data is being used in healthcare, policing and multiplayer online games. The full article is available on the *Twin Cities Business Journal* website.

Professor **Jon Weissman** was selected in a national competition to participate in the second Leadership in Science Policy Institute (LiSPI), on April 11th-12th, 2013 in Washington, D.C. LiSPI was created to educate a small cadre of computing researchers on how science policy in the U.S. is formulated and how our government works. LiSPI presenters include staff supporting the White-house Office of Science and Technology Policy; the House Science, Space and Technology committee; and

(Department news continued on page 4)

representatives from NSF, USDOE, NIH, and others. LiSPI is organized by the Computing Community Consortium (CCC) as part of its mission to develop a next generation of leaders in the computing research community.

**Mats Heimdahl** is currently serving on the National Research Council Computer Science and Telecommunications Board (NRC/CSTB) Committee on Review of the Enterprise Architecture, Software Development Approach, and Safety and Human Factor design of the Next Generation Air Transportation System. The committee studies technical activities that will be necessary to successfully transition to a new air transportation system; assessing risks for the software development that will be necessary for the new system; and determining how to mitigate these risks. The National Research Council is an arm of the National Academies with the mission "to improve government decision making and public policy, increase public understanding, and promote the acquisition and dissemination of knowledge in matters involving science, engineering, technology, and health."

## CS&E happenings

The University of Minnesota's Software Engineering Center hosted the **CodeFreeze** conference at the McNamara Alumni Center last January. Code Freeze 2013 focused on the importance of software anthropology. The conference combined talks, workshops, and a panel session where the speakers fielded audience questions.

CS&E alumni in the Bay Area will be invited to our **Annual Alumni Event**. This year we are planning a socal hour as well as some visits and events. Watch for more details and invitations via email this summer.

The Department continues to host technology-related conferences. Twin Cities CodeCamp 14 had more than 250 attendees, one of the highest turnouts ever. TCCC15 is being scheduled for October 2013.

Department Head **Vipin Kumar** teamed with Electrical and Computer Engineering Department Head David Lilja to host alumni and friends of the departments at three Lunch and Learn events this spring. Attendees learned about the innovative research from ECE Professor Emad Ebini and CS&E faculty members **Stephen Guy** and **Pen Yew**. Guy discussed his projects visualizing crowd movements and Yew discussed his work on dynamic binary translation (DBT) that allows your compiled Intel binary code to run on other vendor's machines such as ARM, or vice versa, without recompiling your code. The Department lunches are free to attend and lunch is provided by the department.

## *CS&E Ninth Biennial Open House and Tech Forum*

*Friday, October 18, 2013*
*8:30-Noon, plus a special afternoon workshop*
*McNamara Alumni Center*
*East Bank*

Please join the Department of Computer Science and Engineering, industry, students and alumni for a day of events including: a keynote from Roni Kohavi, research exhibits from our faculty and industrial partners, and presentation of the Distinguished Alumni Award.
Watch for registration information via email or contact info@cs.umn.edu.

The University of Minnesota Board of Regents approved President Eric Kaler's biennial budget request and legislative proposal for fiscal years 2014-2015. A key component of the budget request is the creation of the MnDRIVE (Minnesota Discovery, Research and InnoVation Economy) funding program. The university will seek $36M for the biennium beginning in 2014 to focus research on four areas that are critical to grow Minnesota industry and business, including supporting robotics, sensors and advanced manufacturing. **Maria Gini**, College of Science and Engineering Distinguished Professor and Associate Head of Computer Science and Engineering talked about how the university and state will emerge as a robotics leader in the nation, benefitting citizens in everything from personal lifestyle to advanced manufacturing. "It is a growing industry with increasing demand," Gini said. Worldwide industrial robot sales went up by 38 percent from 2010 to 2011. The university is a world leader in miniature robots for reconnaissance and surveillance. That technology came out of the U's Center for Distributed Robotics. In addition to spurring Minnesota job development and economic growth, Gini highlighted the importance of robotics to engage K-12 student in science and engineering.

University President Eric Kaler (left) at the legislative briefing with a scout robot and Professor Maria Gini, (seated at right). The President outlined a proposal that will seek funding for research on robotics.

## Faculty speaking engagements

**Paul Schrater** gave keynotes at COSYNE and ESCONS. **Jaideep Srivastava** provided keynotes at IEEE Workshop on Big Data Mining Techniques for Online Sales and Customer Service in Silicon Valley, CA. He also provided keynotes at ACM SIGMOD Workshop on Dynamic Networks Management and Mining (DyNetMM) in New York, NY, and at AAMAS Workshop on Multiagent Interaction Networks, Mining Multiplayer Game Logs to Understand Social Dynamics. **Shashi Shekhar** was a distinguished speaker on Spatial Big Data Analytics at the Computer Science Department, Arizona State University. He provided keynotes for a Workshop on Big Data and Demography at the Institute of Population Research at Ohio State University and the NSF Workshop on Big Data and Urban Informatics at the University of Illinois at Chicago. He also provided a keynote for ACM SIG-Spatial International Workshop on Big Spatial Data. **Dan Keefe** provided a keynote talk at the Midwest Instruction and Computing Symposium 2013. **John Riedl** and Paul Resnick re-presented their 1994 paper, which is now the most cited in the history of the CSCW conference at the ACM CSCW conference in a special session. **Volkan Isler** gave an invited talk at the Fourth CSL Symposium on Emerging Topics in Control and Modeling last Fall at UIUC. **Tian He** gave keynotes at IEICE workshop on Smart Sensing, Wireless Communications, and Human Probes, ACM China Shanghai Division Inaugural Ceremony and the Chinese Wireless Sensor Network Conference.


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# Awards Faculty

Professor **Zhi-Li Zhang** has been named one of the 2013 Distinguished McKnight University Professorship award recipients for his work in computer networking and Internet development. He is one of five 2013 award winners to be honored by this designation and the fifth CS&E recipient. Zhang is a leader in computer networking, with wide-ranging contributions to the research and development of the Internet networking technology. He is internationally respected for his work on packet scheduling and Internet quality-of-service, and on improving the reliability of Internet routing systems. Many of his pioneer ideas and novel algorithms (e.g., video smoothing and staging, service overlay, traffic profiling) have been adopted in real systems. Zhang is a Fellow of IEEE.

Two Computer Science & Engineering faculty are recipients of 2013 college-wide teaching awards. Assistant Professor **Chad Myers** has been selected to receive the 2013 George W. Taylor Career Development Award. The Taylor Career Development Award recognizes exceptional contributions to teaching by a candidate for tenure. In addition, **Joe Konstan** has been given the George W. Taylor/CSE Alumni Award for Distinguished Teaching. Established in 1982, the Taylor/CSE Alumni Award for Distinguished Teaching recognizes outstanding contributions to undergraduate and/or graduate teaching. Konstan is also the 1999 recipient of the Taylor Career Development Award.

Professor **Nikolaos Papanikolopoulos** has been selected as the 2013 recipient of the Richard P. Braun Distinguished Service Award. This award is given by the Center for Transportation Studies to a "transportation professional for outstanding leadership in research and innovation." Richard Braun, for whom the award was named, was the founding director of CTS and a champion of transportation innovation. The award was presented on April 17, during the CTS Annual Meeting and Awards Luncheon at the McNamara Alumni Center.

Assistant Professor **Daniel Keefe** has been awarded a $15,000 3M Nontenured Faculty Award. 3M provides this grant to exemplary new faculty in order to help them advance their careers. His work is in scientific visualization, 3D user interfaces, and interactive computer graphics.

Instructor **Chris Dovolis** was selected to recieve the Morse-Minnesota Alumni Association Award for Outstanding Contributions to Undergraduate Education. Morse Award recipients constitute the membership of the Academy of Distinguished Teachers (ADT). Until this year, these awards were only available to faculty. This year, Professional & Administrative (P&A) employees who teach also became eligible for nomination. Dovolis was the only P&A instructor selected for this distinction.

Professor **Jaideep Srivastava** was chosen to receive the PAKDD 2013 Distinguished Contributions Award by the Pacific-Asia Conference in Knowledge Discovery and Data Mining (PAKDD). Srivastava's research, service to the PAKDD community, and conferences were cited in his selection. PAKDD attracts over 300 delegates annually and is the largest conference in its field in the pacific region.

User Modeling and User-Adapted Interaction (UMUAI), the Journal of Personalization Research awarded Professors **Joe Konstan** and **John Riedl** the 2012 James Chen Annual Award for Best Journal Article for their paper "Recommender Systems: from Algorithms to User Experience." The article was selected based on nominations from journal reviewers, editorial board members and guest editors, and a subsequent comparative review of the shortlisted papers by an award committee.

**John Collins**, **Maria Gini**, Alok Gupta, and **Paul Schrater** together with Wolfgang Ketter of Erasmus University received a 2012 INFORMS ISS Design Science Award for their work "Design of Automated Agents Capable of Recognizing and Forecasting the Economic Environment." Judges for the award commented, "This work is outstanding. The authors have combined design science principles and economic theory to design and evaluate specific artifacts but also to develop "design theory" for software agents. The evaluation is well-conceived and convincing."

## Best Paper Award

Associate Professor **Arindam Banerjee** and Ph.D. student Karthik Subbian were selected to receive the Best Application Paper award at the 2013 SIAM International Conference on Data Mining (SDM13). Their paper, "Multi-model Regression Using Spatial Smoothing," proposes improvements to methods of combining climate change model outputs

# Outstanding CS&E Students

## recognized with Scholarships, Fellowships, and awards

Puja Das was awarded a prestigious IBM Ph.D. Fellowship. The highly competitive award will support Puja's thesis research during the 2013-2014 academic year. Her research focuses on online algorithms which work on streaming data. The work is particularly suitable for financial data analysis where timely analysis of data is essential for decision making. Puja's advisor is Associate Professor Arindam Banerjee. Rong Liu of IBM will be Puja's mentor for the award.

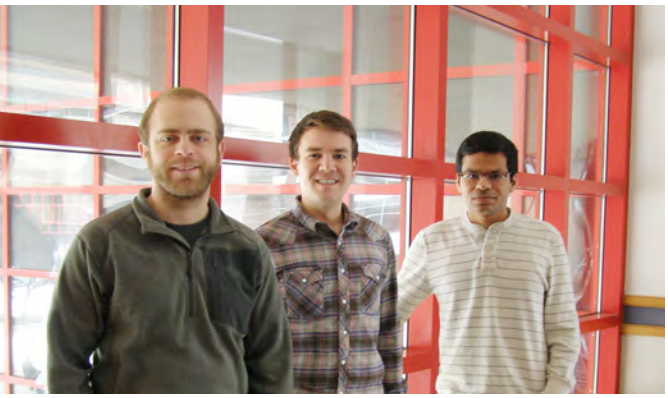
Ph.D. student Luan Nguyen won a best paper award at COLING 2012, in Mumbai, India. His paper, "Accurate Unbounded Dependency Recovery using Generalized Categorial Grammars" was co-authored by Marten Van Schijndel and William Schuler of Ohio State University. COLING is organized by the International Committee on Computational Linguistics.

Ph.D. students Sean Landman, Dane Coffey and Viswanath Gunturi were awarded Interdisciplinary Doctoral Fellowships for 2013-14. The fellowship awards outstanding Graduate School students with interdisciplinary dissertation topics who would benefit from interaction with faculty at one of the University's interdisciplinary research centers or institutes. Dane Coffey works with Arthur Erdman, Director of the Medical Devices Center in Mechanical Engineering, Sean Landman works with Drs. Scott Dehm and Kevin Silverstein in the Masonic Cancer Center, and Viswanath Gunturi works with Professor Henry Liu at the Center for Transportation Studies.

The paper "Sparse Group Selection on Fused Lasso Components for Identifying Group-specific DNA Copy Number Variations," by Ze Tian and Huanan Zhang won the Best Student Paper Award at the 2012 IEEE International Conference on Data Mining (ICDM). The ICDM conference is an established top conference for presenting the world's premier research in data mining.

Joe Myre was was awarded an NSF Earth Sciences Post-doctoral Fellowship starting this Fall. Dr. Myre will construct a computational fluid dynamics model to investigate the relationship between surface roughness and the physicochemical mechanisms which cause dissolution in soluble bedrock settings.

The Graduate School awarded Doctoral Dissertation Fellowship awards to eight CS&E Ph.D. students out of 151 total awarded across the University. The eight students receiving fellowships for 2013-2014 are: Gowtham Atluri, Sanjoy Dey, Bret Jackson, Varun Mithal, Avery Musbach, Dev Oliver, Hung Pham, and Huahua Wang.



Elizabeth Jensen, Nichloas Johnson and Erik Steinmetz have all been awarded NSF EAPSI grants for the summer of 2013. Johnson will be doing research at the Australian National University in Canberra, Australia with Professor Bob Williamson in the machine learning group. Elizabeth Jensen will be going to Tohoku Gakuin University in Sendai, Japan, working with Dr. Ken Sugawara on dispersion and exploration in multi-robot teams. Erik Steinmetz will work wiht Porfessor Matsumoto at the Nara Institute of Science and Technology on the go game.

A University of Minnesota team qualified for the 2013 ACM-ICPC World Finals sponsored by IBM. Team Inazuma 0b11 members Jonathan Hsiao, Lihua Zhang, and Yuan Li will be traveling to St. Petersburg, Russia, where the competition will be held June 30 through July 4, 2013 at the National Research University ITMO. This is the second consecutive year that this University of Minnesota team has advanced to the World Finals.

### 2013-2014 CS&E Lando Scholarship Awards

Joseph Mikula
Benjamin Bosch
Andrew Erickson
Derian Andersen
Jacob Grimes
Max Veit
Grant Elbert
Philip Homan
Sam Torzewski

# A Reflection of Accomplishments

On Tuesday, December 11, 2012 the Departments of Computer Science and Engineering and Electrical and Computer Engineering joined for a reception to celebrate creation of a permanent art display commemorating the impact the departments have made in the fields of supercomputing, medical devices, and the Internet.

Guests enjoyed food and drinks on the 4th floor in view of the new display. Dennis Branca of Cooper Power Systems served as the Alumni Program Host for the event which also featured short talks from Tom Misa, Director, Charles Babbage Institute, David Rhees, Executive Director, Bakken Museum and Joe Konstan, Professor, Department of Computer Science and Engineering. Each of the speakers had time to elaborate on the achievements of the departments that are featured on the wall: the pioneering in computing by Seymour Cray, the lifesaving work of Bakken and the pacemaker and the record of medical innovation in the state of Minnesota and the pioneering work in recommenders systems for the internet.

Vipin Kumar with Lori Dietrich and Steven Piazza.

Tom Misa with Dick Hedger.

The completed wall installation in Keller Hall.

## Minnesota's Computing at the Charles Babbage Institute

The Charles Babbage Institute was founded in Palo Alto, California, in the late 1970s by Erwin Tomash (Electrical Engineering class of 1943). After graduating from the university, Erwin had worked for Engineering Research Associates, the pioneering St. Paul computer company, then took on a series of executive positions in the industry culminating with leadership of Dataproducts, a leading manufacturer of computer printers and computer memory. Erwin sensed, even then in the 1970s, that computing was remaking the world. He created the Charles Babbage Institute as a means to better understand this momentous history.

CBI came to the University of Minnesota in 1980 after a nation-wide search for a permanent home. Its program in collecting archival materials, conducting oral history interviews, and doing research projects expanded when Arthur Norberg arrived in 1981 as its first permanent director. Working closely with Tomash and a high-level set of advisors, Norberg would be instrumental in building CBI into the internationally recognized archive and research center that it is today. Many of its oral histories, rare documents, unique photographs, and the finding guides to archival collections can be found online at cbi.umn.edu.

Minnesota was then—and remains today—an attractive place to advance the history of computing. One of the university's signal advantages in the national CBI site search was its well-established graduate program in the history of science and technology. Indeed, the historian of physics Roger Steuwer, then head of the HST program, led the university bid to secure CBI. Each professor in HST has their faculty appointment in one of the departments of the college. Steuwer's was in physics, while Norberg's was in computer science (and CBI's

Bruce Wallenberg reviews the wall.


Rich McNamara with Ashok Nangia.

Rhonda Franklin and a visiting lecturer.

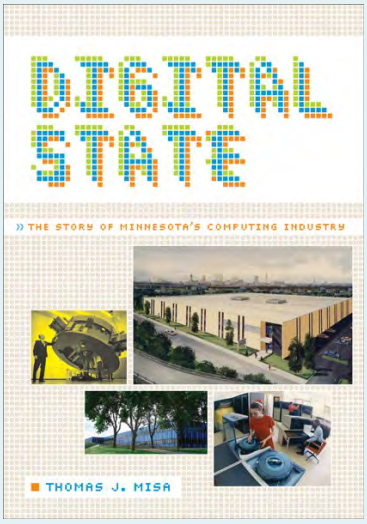
Yousef Saad and Abhishek Chandra.

Associate Dean Mos Kaveh with Jamshid Vayghan and Pen Yew.

Jeff Brown and Jeremy Bolster.

present director, Tom Misa, is appointed in electrical engineering). The CBI search committee saw a winning combination in the presence of a strong history of science and technology program and built-in proximity to the science and engineering departments of the college.

Minnesota's prominent computer industry, then near its peak, was another significant draw. The Engineering Research Associates had been reorganized into a division of Sperry Rand Univac, while the well-known Control Data was itself a spin-off from Univac. Minneapolis Honeywell had some distinction in the minicomputer market, not least by making the hardware nodes for the Arpanet, forerunner to the Internet. IBM Rochester added design, development, and manufacturing muscle nearby. This fall, CBI director Tom Misa is publishing the first full book-length treatment of this remarkable tale with the University of Minnesota Press. His book, Digital State: The Story of Minnesota's Computing Industry, is described by Margaret Anderson Kelliher (president and CEO of the Minnesota High Tech Association and former Speaker of the Minnesota House of Representatives) as "thoroughly researched and engagingly written . . . a much needed look at the roots of Minnesota's high-tech economy."



# Spring 2013 Commencement

The Department of Computer Science and Engineering celebrated the commencement ceremonies for its graduate students and undergraduate students at the Mariucci Arena this spring. Graduate students received their degrees in a ceremony on April 26, 2013 and the College of Science and Engineering undergraduate commencement ceremony was held Friday, May 10, 2013. This year the department awarded nearly 150 undergraduate degrees and almost 100 graduate degrees. We send our congratulations to all of our graduating students and wish them the best of luck in the next stage of their careers.

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# Alumni

Jeff Dean

## Jeff Dean receives prestigious ACM Infosys Award

CS&E alumnus Jeff Dean has been selected to receive the 2012 ACM - Infosys Foundation Award in the Computing Sciences "for his leadership in the science and engineering of internet-scale distributed systems." Dean received the citation along with his longtime collaborator Sanjay Ghemawat. The award includes a $175,000 cash prize.

In the words of ACM President Vint Cerf, "(Dean and Ghemawat) provided the technological underpinnings of an indispensable information retrieval resource. As a result, tens of millions of engineers, scientists, and scholars as well as ordinary consumers rely on these distributed software systems, which harness the power of tens of thousands of computers."

Dean is an ACM Fellow and member of the NAE. He received a B.S., summa cum laude from the University of Minnesota in Computer Science & Economics in 1990, and subsequently received a Ph.D. from the University of Washington. Dean is the 2007 recipient of the CS&E Distinguished Alumni Award.

## Alumni achievements

Monica Anderson (Ph.D. 2006) was recently promoted to Associate Professor at the University of Alabama.

Dan Cosley (Ph.D. 2006) has been appointed General Co-Chair of the CSCW 2015 Conference. The annual CSCW Conference is sponsored by ACM, and is the leading international conference for presenting research on the design and use of technologies that affect groups, organizations, communities, and networks.

Bonnie Holub (Ph.D. 1987) has been added to Ever-Green Energy's Board of Directors. Dr. Holub is the founder and CEO of ArcLight, Inc., a small company focusing on data analytics, data visualization, and big data. She also holds the Honeywell Endowed Chair in Global Technology Management in the Graduate Programs in Software, School of Engineering, University of St. Thomas, St. Paul, MN. Ever-Green Energy is one of the country's foremost experts in advancing integrated energy systems.

Ioannis A. Kakadiaris (Ph.D. 1997) is a Hugh Roy and Lillie Cranz Cullen University Professor of Computer Science, Electrical & Computer Engineering, and Biomedical Engineering at the University of Houston, Houston, TX.

Aanastasios Mourikis (Ph.D. 2008) is an Assistant Professor of Electrical Engineering at UC Riverside. He recently won the NSF CAREER Award.

Nikolas Trawny (Ph.D. 2010) now works at the NASA Jet Propulsion Laboratory. He has taken over the JPL Task Lead of the Autonomous Landing and Hazard Avoidance Technology (ALHAT) project. ALHAT is a technology development project to enable safely and autonomously landing a spacecraft on the Moon. The project is led by Johnson Space Center (JSC) and supported by the Jet Propulsion Laboratory (JPL) and Langley Research Center. JPL is responsible for the Hazard Detection System that combines data from multiple sensors to map and detect hazards and to identify safe landing sites. He is also involved in precision navigation technology for landing on Mars, asteroids, and comets.

The Department is sad to note the passing of computer science pioneer George Champine. George, a Minnesota native and alumnus of the University, was one of the first 2000 computer programmers in the world and an employee of Univac in St. Paul. During his time at Univac he wrote much of the software for the first airborne computer and led development for the first ground-based digital missile guidance system and computer-controlled radar. He later went on to high positions at Vydec (a subsidiary of Exxon), Digital Equipment Corp., and Compaq. George was also active in education, serving as president of the University of Minnesota's Institute of Technology Alumni Society from 1979-1980 and teaching classes at Hamline University, the University of Minnesota, University of Texas, University of Massachusetts-Lowell, and MIT. He succumbed to leukemia after two and a half years. He was 78 years old.

# ALUMNI SPOTLIGHT: ROBERT MAIER

Robert Maier (Ph.D. 1990) graduated in 1977 with a B.A. in Anthropology. He received his M.A. in Public Affairs in 1980, followed by an internship with the Minnesota State Senate Research Office. He credits this early training and experience with developing his analytical and writing abilities. However, at the time, he decided against a career in government. "There was a pervasive feeling that Reagan was going to downsize the role of government and I had a life-long interest in engineering," he says. "At the same time there was an atmosphere of excitement around the computing industry in the area." Maier joined Control Data Corporation in 1981 as an applications analyst. He came to the CS&E department in the late 1980s for his Ph.D. work in math and computer science, ultimately working under former department chair J. Ben Rosen in the area of parallel methods for mathematical programming. Upon graduation, Maier received a post-doctoral appointment with the University's Army High Performance Computing Research Center (AHPCRC). That turned into a permanent scientist position with Network Computing Services, Inc. which operated the AHPCRC for the University. There he continued to work alongside faculty members of the CS&E Department and developed a productive collaboration with the late H. Ted Davis, former Dean and Professor of Chemical Engineering and Materials Science. Maier said that "Davis was the most important influence in my career. Under his leadership we used supercomputing to achieve new scientific accomplishments in the area of porous media physics."

As an AHPCRC staff scientist, Maier extended the collaboration with Davis to include scientists at the U.S. Army Corps of Engineers Waterways Experiment Station ((WES) now the Engineer Research and Development Center (ERDC)) in Vicksburg, MS, visiting Vicksburg frequently. In 2003, Maier accepted a position with the ERDC Information Technology Laboratory (ITL) as a Computer Scientist assigned to the ERDC Supercomputer Center, where he has been working since.

Today, Maier is Chief of the ERDC-ITL Scientific Computing Research Center and Director of the Supercomputer Center. The Center provides supercomputer access for some 900 engineers and scientists throughout the Department of Defense. Examples of non-classified projects on the ERDC supercomputers could be radiation models for lasers for the Air Force and corrosion studies for Navy weapons protection, but much of the work is basic research on fundamental phenomena in chemistry, physics, and fluid dynamics. The typical life cycle for a supercomputer at ERDC is about four years, after which new systems provide significantly more capability and, consume less energy. This year, ERDC will integrate three Cray XE6 systems into a single capability system to support larger core-count jobs on a routine basis. It will include 4,720 32-core nodes, or about 150,000 CPU cores, with a peak performance of about 1.2 petaflops, and will draw over three megawatts of electricity. Nevertheless, according to Maier, "DOD is still a poor cousin to the DOE labs when it comes to supercomputing, but this will help push our code base toward an exaflop capability system sometime in the mid-2020s."

Maier cites the University's early commitment to supercomputing in the 1980s, when it vied for status as an NSF Supercomputing Center. "The commitments by the State, the University, and local industry helped establish Minnesota as a significant center for parallel computing. Vipin Kumar, in particular, played a key role in hiring and training members of the parallel computing community." The Minnesota Supercomputer Center, located on the West Bank of the Mississippi River at the corner of Washington Avenue and I35W, was the visible anchor of a proposed technology corridor leading from campus to downtown Minneapolis.

Maier is glad to see supercomputing back on the main campus. "Walter Library is a wonderful building and arguably the center of campus. I can't think of a better place to integrate computing into student life."

# ALUMNI SPOTLIGHT: JOHN ZAMOW

For John Zamow (B.S. 1988) the interest in coding runs in the family. Zamow's father spent 40 years working for Sperry Univac, and later Unisys. Computers were introduced in the family home for John at a young age. "We had one of the terminals in the house with the phones in the back." Zamow's father used the machine for work, but he took the time to teach Zamow and his brother some basic coding, enough to play games. "Dad worked on it but my brother and I played around with it." The early access to computers and coding piqued Zamow's interest in computer science. When it was time to choose a major in college, computer science was a natural choice.

Zamow's first job at American Linen stemmed from an internship he started while still finishing his major. Zamow created a maintenance program for their washers, dryers and irons. "They had these dryers that are meant to hold 300-1000 pounds so they bought a program to help maintain the machines at all of their locations and I helped them customize the program to their needs." The work required a lot of time travelling. The travel was exciting initially, but after a year on the road nearly every week, he says he knew that a career involving constant travel was not for him, "after a year, I was done."

# Alumni spotlight:

## Rebecca Schatz

Rebecca Schatz (M.S. 1985) was a successful software engineer in a promising career travelling to Japan to begin a new work assignment abroad when she stopped in San Francisco and visited The Exploratorium. She was inspired by what she saw there, a series of hand-on exhibits and activities to teach children about science and art.

Upon returning from Japan a year later, Schatz was invigorated by the way the Japanese culture focused on science and engineering, and also frustrated with the treatment of engineering education in America. "I felt like the United States had this wonderful record of innovation, and now we were starting to become complacent with our successes." She was especially disappointed with the lack of engineering in the schools. "Engineering is not something that kids really knew about," she explains. "The kids who knew about engineering were kids who had a father or an uncle who was an engineer," which she found to be a sharp contrast to the way children play. Schatz says engineering comes naturally to all kids. "Kids are natural engineers. They come into kindergarten building and creating and then we just cut them off – we take away their blocks." She adds, "We were losing out on capable kids because we were not feeding them things that work for them. I felt that the kids were missing a whole different kind of education."

Schatz decided to take time off of her work in software engineering to explore the idea of engineering outreach. "I felt that we could optimize the strengths of the American system to reach more kids and teach them about engineering." Schatz created The Works, which started as an hand-on exhibit in the Bell Museum that focused on the technology process. Since then, the exhibit has grown to its own Works museum, housed in a 40,000-sqaure-foot location in Bloomington that received more than 70,000 visitors last year. The museum's stated goal is "awakening every child's inner engineer. "

Schatz was not content to end her work there. Her goals have expanded beyond the museum to adding engineering to the state curriculum. In 2009, the Minnesota K-12 Academic Standards in Science were changed to include engineering education requirements. Teachers must embed hands-on lab activities rooted in scientific inquiry and engineering design into their science curriculum at all grade levels.

"Engineering teaches a process of identifying and solving problems. Children discuss goals, gather information, brainstorm possibilities and come up with imaginative solutions," she explains. "Working hard and dealing with frustration teaches children a mindset to learn more and go further."

After 25 years of work at The Works, Schatz retired from the museum in 2012. She is now busy with new projects, one of which involves getting back to her roots as a software engineer. Schatz recently started Code Savvy, an organization "dedicated to inspiring kids and adults to become code-savvy, that is, to understand the kind of creative thinking that goes into coding, and to try out programming computers and devices." She is energized by the prospect of diversifying the field and getting more women into the field of computer science. As she recently wrote on her blog, "We need a diverse workforce because diversity of mind and experience are the best path to creative, collaborative problem solving. And there are plenty of problems to solve in the world!"

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That prompted Zamow to move to Seagate and later Honeywell before he branched out on his own doing consulting work. When the economy turned in the late 2000s, Zamow returned to Seagate where he is working today with clients like Dell in doing co-planning and forecasting work. The work allows him a great quality of life, "It's been 25 years since I graduated and I'm still able to live in Bloomington and work in the Twin Cities." It also allows him time to attend Gopher hockey games, for which he holds season tickets.

There is also hope that his kids may continue the family tradition of software engineering and perhaps at the University. He has a 16-year-old daughter who is interested in joining a Robotics league and who shows interest in the field. "I told her that I would be happy to help her." His 13-year-old is also part of a Lego Robotics team." Zamow is an advocate for the computer science major, especially considering the high demand for computer science students in the current job market. "The economy may have slowed for a while," he explains, " but now it's back and stronger than it's ever been. We get many resumes, but those computer science students always go to the top of the stack."

(story continued from page 1)

## Machine Learning continued

$100M today. The team acts each day as if they are in 1990, running simulations using their methods without looking at the next day's data. "I actually have to guess, and then I look and say 'I have made the wrong decision' and then I adjust and run for the next day." Using daily S&P500 data for the past 23 years and a benchmark NYSE dataset, Banerjee and Das have shown that "Meta Algorithms outperform the existing portfolio selection algorithms by several orders of magnitude, and match the performance of the best techniques currently available." The work has helped Das earn an IBM Ph.D fellowship, an intensely competitive worldwide program. The program selects exceptional Ph.D. students who have an interest in solving innovative problems that are important to IBM and many academic disciplines, from computer science to management.

Banerjee is applying his methods to social media analysis as well. Together with researchers at IBM, he is building an analytics engine for Twitter. "The current social media analytics engines are pretty primitive. It's somewhat easy to count likes and clicks." Banerjee feels that those methods are going to run out of steam very soon. The IBM analytics engine, called Banter, will actually mine social media for opinions. "People are constantly sharing their opinions about things through social media, be it movies, music or other things that affect them." If marketers or policy makers can distinguish the sentiments of their target audience then they have the opportunity to change ad campaigns or adjust public policy to respond to popular opinion. He adds, "Social media is actually a great way to influence the thinking and change social views without doing polls. With financial and policy decision making – you want to know it sooner than later."

Banerjee says the problem in Twitter is the sheer volume of material to mine for opinions. "If you are just maintaining counts of `happy' and `sad,' that's easy to do. For more complex analysis, following dialogue, you will need to use our methods." This will be especially problematic as Twitter grows. "Soon we are going to reach a billion tweets a day, how are you going to process all that data?" Banerjee and his researches have written several papers on their system and have filed joint patents with the team at IBM, who are heavily investing in the work. He is also beginning collaborations with Google and Yahoo.

Banerjee's work can also be applied to the study and prediction of climate change. "We are building and using those tools for climate work to detect 100 years of draughts. We have 100 years of data, at a high resolution, recording every month's precipitation, and we are trying to predict megadroughts - prolonged droughts lasting five years or longer. In our system it takes less than a minute to find all the draughts. This is a hundred million data points and the analysis runs on 500+ cores." Now Banerjee's clients are not requesting 100 years of data, but 1000 years and more.

Banerjee and the machine learning community agree that their field is "highly relevant, even critical, in solving these global challenges." However, he notes that most of the current research in machine learning doesn't focus on global challenges, which he attributes to the lack of experts in these areas who are knowledgeable of the ways machine learning can be applied to their work and the difficulty in monetizing the work when compared to applications that relate to web search and advertising. Banerjee is unphased, "I'm working with great researchers who are really eager collaborators." Those researchers include Regents Professor Peter Reich in the Department of Forest Resources.

Perhaps the best description of Banerjee's work comes from his introduction from an Introduction to Machine Learning talk at CIDU 2011, "he comes up with wonderful hammers and finds good nails to apply them to."

(commencement photos continued from page 10)

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